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Brain Tumor Detection in MRI Using Segmentation Techniques

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Abstract: In this paper, an attempt has been made to summarize segmentation techniques which are useful for separation of tumor region from brain tumor MRI images. By selecting a proper segmentation technique, it is possible to segment tumor region accurately, which helps in measuring the area of tumor region from brain tumor MRI image. This is possible by using digital image processing tool. Digital image processing is useful for CT scan, MRI, and Ultrasound type of medical images. Digital image processing improves the quality of these medical images using various enhancement techniques. From this enhanced image the radiologist can easily identify infected region and its location. Digital image processing also able to separate out infected region from MRI or CT scan images easily which helps radiologist for diagnoses of the disease at earlier stage. It has several advantages overother imaging techniques, providing high contrast between soft tissues. However, the amount of data isfar too much for manual analysis, which has been one of the biggest obstacles in the effective use of MRI.The detection of tumour requires several processes on MRI images which includes image preprocessing,feature extraction, image enhancement and classification. The final classification process concludes that aperson is diseased or not. Although numerous efforts and promising results are obtained in medicalimaging area, reproducible segmentation and classification of abnormalities are still a challenging taskbecause of the different shapes, locations and image intensities of different types of tumours. In thispaper, various approaches of MRI brain image segmentation algorithms are reviewed and theiradvantages, disadvantages are discussed.

Keywords: MRI, segmentation, morphology, MATLAB.

1. INTRODUCTION

Image segmentation is that the drawback of partitioning a picture into significant regions on the premise of grey-level, colour, texture. This means the generality of the problem- segmentation may be found in any image-driven method, e.g. fingerprint/text/face recognition, trailing of moving people/cars/airplanes, etc. for several applications, segmentation reduces to finding Associate in nursing object in a picture. This involves partitioning the image into 2 categories of regions - either object or background. It’s merely not possible in apply to manually method all the pictures (like magnetic resonance imaging and CT scan), owing to the overwhelming quantity of data it provides. Therefore we have a tendency to style algorithms that search for bound patterns and objects of interest and place them to our attention. To Illustrate, area unit cent standard application is to look and match illustrious faces in your photograph library that makes it attainable to mechanically generate photograph collections with a precise person. a crucial a part of this application is to section the image.

Automated classification and detection of tumors in different medical images demands high accuracy since it deals with human life. Also, computer assistance is highly sought in medical institutions due to the fact that it could improve the results of humans in such a domain where the false negative cases must be at a very low rate. It has been proven that double reading of medical images could lead to better tumor detection. But the cost incurred in double reading is very high, therefore good software to assist humans in medical institutions is of great interest nowadays.

Different approaches that can produce medical images must be studied. Also, the technique that produces those images is very important in order to know what to apply to a certain medical image in order to get better results. A lot of methods have been proposed in the literature for CT (Computed Tomography), such as scans, different types of X-rays, MRI images and other radiological techniques. With all this effort done in the research field, there is still a lot of place for improvements and the medical image processing is a domain in continuous expansion. Why is this domain in continues expansion and without and good accepted method? This is due to the fact that in such an important domain, the accuracy must be very high and the false negative rate must be low. The problem is that it is not very easy to obtain such results. The idea is to reduce human error as much as possible by assisting physicians and radiologists with some software that could lead to better results. This is important since it involve saving human lives. Figure represents an input brain image.

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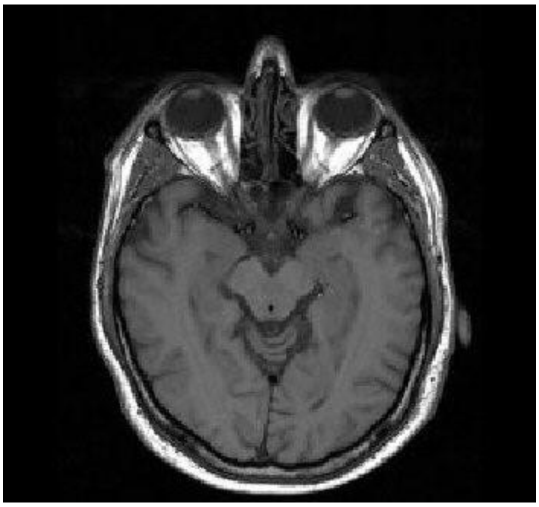

Figure 1: Brain MRI

2. SEGMENTATION TECHNIQUES

Segmentation technique may be divided roughly into the subsequent categories:
(1) Thresholding approaches,
(2) Region growing approaches,
(3) Classifiers,
(4) Bunch2 approaches,
(5) Andrei Markov random field models,
(6) Artificial neural networks,
(7) Deformable models,and
(8) Atlas guided approaches.

Different notable ways conjointly exist. Of the various approaches expressed above; thresholding, classifier, clustering, and Andrei Markov random field approaches may bethought of component classification ways.
Three normally used agglomeration algorithms area unit the
1) k-means,
2) The segmentation c-means algorithmic rule,
3) The expectation-maximization (EM) algorithmic rule.

Within the k-means agglomeration algorithmic rule clusters mean is iteratively computed and a mean intensity every for every} category is assigned and image is mesmeric the by assignment each component within the category with the nearest mean. The segmentation c-means algorithmic rule generalizes the k–means algorithmic rule, giving soft segmentations supported segmentation pure mathematics. Coaching knowledge isn't needed by agglomeration algorithms, however they are doing need associate initial segmentation (or equivalently, initial parameters). Therefore, not like classifier ways, agglomeration algorithms may be sensitive to noise and intensity in homogeneities. This lack of special modeling, however, will give important benefits for quick computation.

K-means agglomeration algorithmic rule is additionally associate unattended technique for the segmentation of the image. in a very mister image of the top there area unit several regions that area unit of comparable intensities, that lead to several native minima that will increase over-segmentation. The coarse area unites are smoothed within the segmentation by k-means technique. K-means agglomeration is employed as a result of it's straightforward and has comparatively low procedure quality. Additionally, it's appropriate for medical specialty image segmentation because the range of clusters (K) is sometimes glorious for pictures of specific regions of human anatomy.

3. PROPOSED TECHNIQUE & RESULTS

There are stages involved in the proposed model which starts from the data input to output. The first stage is the image processing system. Basically in image processing system, image acquisition and enhancement are steps that need to be done. In this project, these two steps are skipped and all the images are collected from available resources. The proposed model requires converting the image into a format capable of being manipulated by the computer. The MR images are converted into matrices form by using MATLAB. Then, the model is developed using MATLAB programming. After the model is successfully developed, the classification of the MR images starts.

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Simulation Results:

Figure 2 shows the proposed GUI for Brain Tumor Detection from MRI. It has features of calculating various accuracies like linear, polygonal, RBF and quadratic accuracies. The resulting segmentation can be used with highest accuracy of 90%.

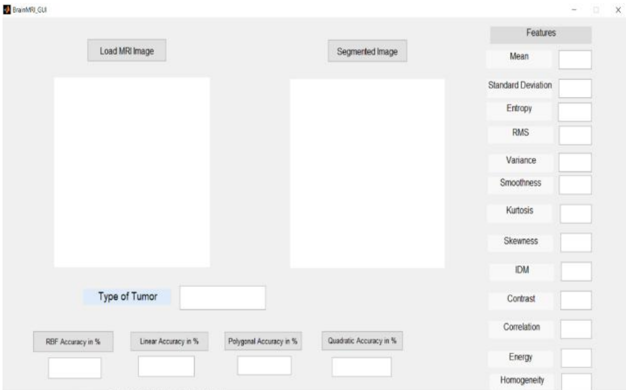
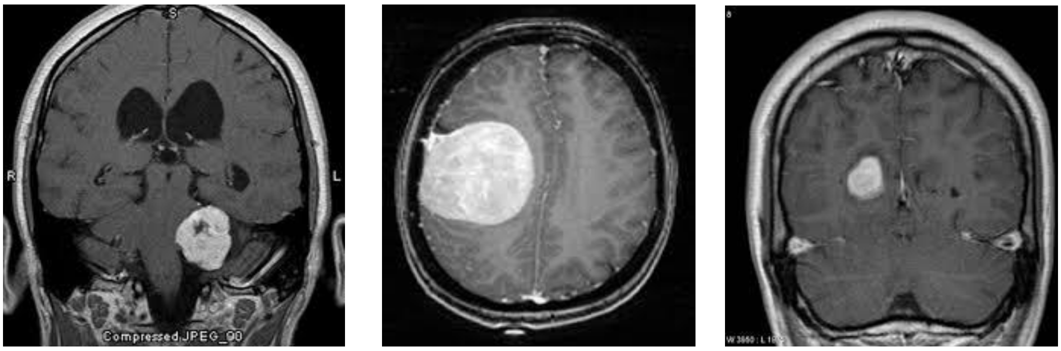


Figure 2 Proposed GUI

Figure 3 a, b and c represents input images of the MRI which are to be processed and the corresponding outputs are given in figure 4, 5 and 6.



(a) (b) (c)

Figure 3: (a), (b) and (c): Input Images

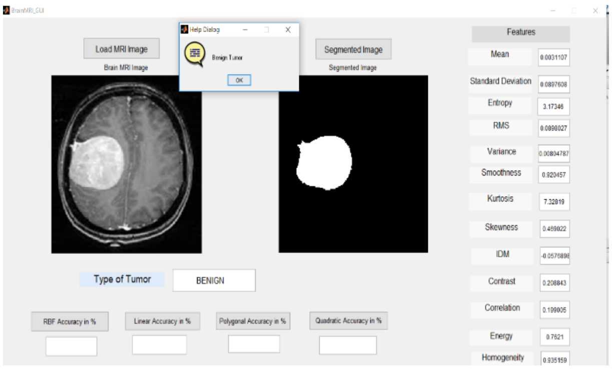


Figure 4: Detected tumor in segmented Image for figure 4.10(a)

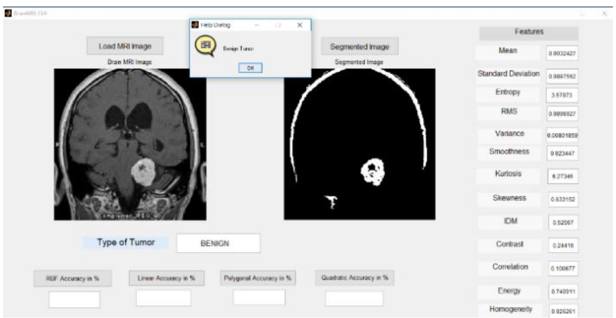


Figure 5: Detected tumor in segmented image for figure 4.10(b)

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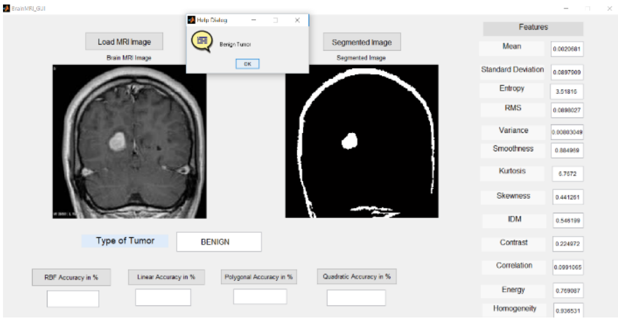

Figure 6: Detected tumor in segmented image for figure 4.10(c)

Figure 7 represents results of accuracies involved through image Figure 3(a), Figure 8 represents results of accuracies involved through image Figure 3(b) and Figure 9 represents results of accuracies involved through image Figure 3(c).

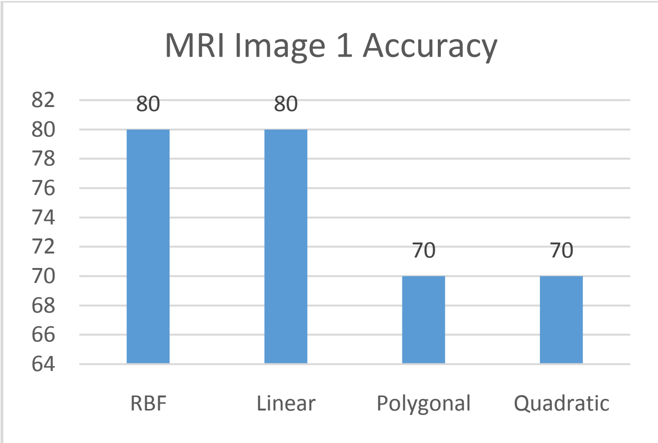

Figure 7: Accuracy Comparison 1

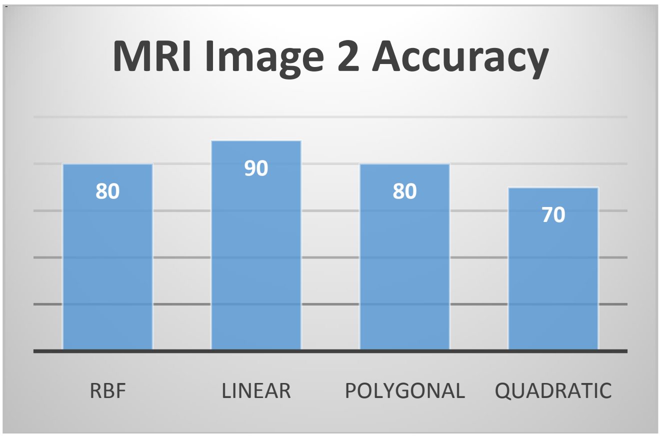

Figure 8: Accuracy Comparison 2

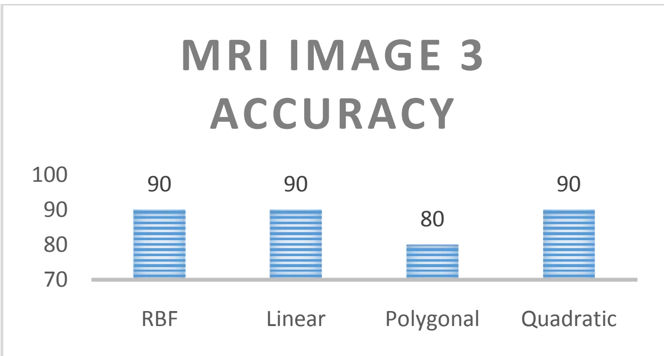

Figure 9: Accuracy Comparison 3

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Table 1: Accuracy Comparison 1

	RBF	Linear	Polygonal	Quadratic
Image 3	90	90	80	90

Table 2: Accuracy Comparison 2

	RBF	Linear	Polygonal	Quadratic
Image 2	80	90	80	70

Table3: Accuracy Comparison 3

	RBF	Linear	Polygonal	Quadratic
Image 1	80	80	70	70

4. CONCLUSION

Following conclusions were drawn from the thesis:

- When only SOM is used for the clustering, the output image is not segmented properly as compared to the Clustering method or k-means but the edge detection of the images is better than the latters.
- Using fcmalogwith the SOM gives better segmented image as compared to SOM alone or fcm or k-means in terms of smooth clusters.
- In some images (Segment 6 and Segment 7), because of noise the outputs are not so accurate when compared to the outputs of Actual image and clustered image.
- The Texture filter method proposed uses a large segment set and various inputs are required during the simulation, but the average overall time taken to run the simulation is less when compared to alone for clustering method.

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